TECHNOLOGY

Local DBS Not Just Pie-in-the-Sky

By GARY KIM

Direct broadcast satellites can't provide local TV service, an old saw goes.

Wrong, say backers of Local-

initial base of 2 million households in 1995, and 3 million additional homes added in each of the first five years, said Selman Kremer, president of Tulsa, Okla.-

Industry satellite engineering expert Norman Weinhouse is L-DBS' engineering vice president. Weinhouse spent 16 years with Hughes Aircraft Co. before found-

its own orbital assignments. Instead, the company says it has tentative arrangements for the necessary slots with existing holders of such rights.

20th markets would pay $11,667. Prices drop further for the 21 to 40 TV market to $8,333 and slide to $6,667 for markets 41 to 60.

Fees in each market for high-

CABLE VISION

OCTOBER 7,1991

New DBS System Planned

Cable may be on the verge of losing one of its trump cards in the competitive battle against DBS. Ed Taylor, founder of Southern Satellite Systems (the progenitor of Tempo Enterprises), says he has developed a technique that will permit satellite-direct delivery of local signals in digital NTSC or whatever HDTV format is ultimately approved by the FCC.

Cable operators have argued that only their technology can provide local tie-ins for viewers. If DBS can do the same thing, and in formats that seem destined for future signal delivery, Taylor may have negated a significant cable advantage. He claims that "no new inventions or unproven technologies are involved in this DBS plan."

The venture, known as LOCAL-DBS Inc., calls for eventual use of three high-power DBS satellites, to be built by Space Systems/LORAL. The first would be launched in 1995.

Local broadcasters would uplink to these satellites, and their signals would be sent back to earth in localized spot beams. These beams would supplement the wider-range signals sent from satellites carrying cable, broadcast and narrow-interest networks.

Taylor and his colleague, cable pioneer Selman Kremer, express confidence that they'll be able to raise the nearly $1 billion necessary to take it to fruition. Their principal sources of funding will be private investors, public issues and the sale of condominium transponders to local broadcast stations. "We have no intention of going through the nonsense that SkyPix has experienced when it comes to raising capital," says Kremer. *•Tom Kerver*

DBS May Offer Ride

Localized DBS Service Could Carry TV Stations on Spot Beam

DBS, From Page 3
said the company is in discussions with Local-DBS.

Gary Burnell, financial consultant for Local-DBS, said the necessary capital will be raised

vision stations, Burnell said. The public stock offering is a possibility, but not a certainty, he added.

Although some stations are interested, Burnell said, none has yet signed a contract.

such a satellite-delivered broadcast service, nor has it secured orbiting positions for its satellites.

Local-DBS does not have a large staff. Burnell said, although

the offices of Taylor Communications Inc., a consulting firm owned and operated by Taylor.

Charles Sherman, senior vice president for television at the Na-

closely before forming an official policy, he added.

Advanced Communications of Washington is another entrepreneurial firm vying for a foothold in the local DBS business. It has

ATTACHMENT 3

DBS FOR LOCAL BROADCASTING

FROM THE

NAB 1992 BROADCAST ENGINEERING CONFERENCE PROCEEDINGS

DBS FOR LOCAL BROADCASTERS

Norman P. Weinhouse
Local DBS, Inc.
Tulsa, Oklahoma
Bell Canyon, California

Abstract- A satellite system whereby every existing television broadcast station in the U.S. can transmit program(s) to a 200 or 300 mile diameter coverage area is described. Four (or more) NTSC channels or two HDTV channels are transmitted in each satellite transponder, free of the impairments and limitations imposed by traditional terrestrial broadcasting.

The satellite to provide this service is described in detail showing how the narrow beams are formed and how the signals are processed. Frequencies are re-used through geographic isolation allowing a large number of reliable low power transponders on board. Therefore a large number of users can be accommodated.

A companion EIRP budget is given which shows that performance margins are equal to or better than National DBS networks with 230 watt transmitters on board.

Digital source coding and transmission are planned for both NTSC and HDTV channels. Software features will include conditional access, blackout of restricted areas within the beam to avoid duplication of programs, and a variety of data and personal messages to selective receivers.

INTRODUCTION

Did you know that the FCC has set aside 1000 Megahertz for television broadcast? Yes, one whole Gigahertz for broadcasting of television directly to homes. If this speaker was a broadcaster, I would be plenty angry if someone other than a broadcaster were to use that spectrum. The spectrum has been allocated to a satellite service. Internationally it is called the Broadcast Satellite Service (BSS). In the U.S. it is commonly called DBS for Direct Broadcast Satellite, or more properly Direct Broadcast Satellite Service as in Part 100 of the FCC rules. No matter what you call it, it is a Broadcast Service, and it would be tragic if broadcasters as we know them did not use it.

DBS has been perceived as a national kind of service without the localism of broadcasting. Up to now all planning by applicants, licensees, and programmers interested in using this resource has been directed toward serving the entire U.S. with TV programs. Now, the convergence of several technologies has made it possible for localism in satellite broadcasting.

TECHNICAL PARAMETERS OF DBSS

Technical aspects of the Direct Broadcast Satellite Service for the International Telecommunications Union (ITU) Region II, which includes the U.S., are given in the Final Acts of the 1983 World Administrative Radio Council (WARC). The FCC has, with very few caveats, adopted those standards but they have not yet been codified into the rule and regulations.

TABLE 1
SOME TECHNICAL FEATURES OF DBS
IN THE UNITED STATES

PARAMETER	ALLOCATION/STANDARD
1. Orbital Slots (West Longitude)	61.5°, 101°, 110°, 119°, 148°, 157°, & 175°
	This spacing allows extremely small receive dishes from an interference standpoint. Dishes of less than 12 inches in diameter can be

	used if the power from the satellite is adequate.	
2. Operating Frequency Band	Feeder (UP) Link: 17.3 to 17.8 GHz Downlink: 12.2 to 12.7 GHz	
3. Polarization	Circular; Both left and right hand polarization are allowed from an orbital	

a parabolic reflector antenna is displaced from the parabolic axis of revolution, a beam is produced that is squinted from the boresight (axis of revolution). If a single reflector with a multiplicity of feeds is used, a multiplicity of beams are formed. Figure 5 shows how a single reflector with multiple feeds can produce a "shaped beam" to fit coverage of a particular land mass; in this case Mexico. In the shaped beam case, the feed horns are connected by a power splitting network to produce the desired result. In the Local DBS case, a separate feed horn is used

utilize low power amplifiers in the 7 to 15 watt output range as opposed to the National DBS which utilize 120 to 230 watt output amplifiers. The weight and power capacity of the national and local satellites is about the same, and they can share a common bus. Instead of a single common input from the receiving antenna and a single common output to the transmitting antenna, the Local DBS has input and output from individual feed horns. Figure 6 is a partial black diagram of the local DBS.

EIRP COMPARISON NATIONAL AND LOCAL DBS

TABLE 2 - EIRP COMPARISON

PARAMETER	NATIONAL DBS	LOCAL DBS
1. Power Amplifier Output - dBW	+23.6 (230 Watts)	8.8 (7.5 Watts)
2. Output Multiplexer and Feed Line Losses - dB	1.5	1.0
3. Antenna Beamwidth - Degrees	3° x 8°	0.5°
4. Peak Antenna Gain - dB	31 (55% eff)	49 (40% eff)
5. Peak EIRP - dBW	53.1	56.8
6. Geographic Loss - dB	1.0	3.0
7. Edge of Coverage EIRP - dBW	52.1	53.8

The EIRP from the Local DBS is expected to be at least 1.5 dB better than the national service everywhere in the coverage area of both services. It should be noticed that the difference in transmitter power is more than made up by antenna gain. The loss between power amplifier and antenna is less in the Local DBS case since a power division network to a multiplicity of feed horns is not required.

Reliability of the Local DBS should be better than the National Service. Five to 10 watt power amplifiers in satellites have a proven track record of phenomenal reliability. Use of satellite amplifiers of 120 watt and higher has been limited, but the results have been somewhat disappointing. Recent experience has been good however. Use of the low power amplifiers represents very low technical risk.

DIGITAL SOURCE CODING AND TRANSMISSION

The Local DBS system plans to use digital compression for both video and sound because of its spectrum efficiency. Transmission will be digital utilizing a power and spectral efficient technique. Spectrum efficiency is not as important in satellite transmission as is power efficiency. Digital compression in the source coding will allow more television channels in a transponder than might otherwise be possible without compression. Use of QPSK modulation with modest error correction will allow use of extremely small ground receiving antennas.

Even the purest of the purists in the broadcast industry concede that today's technology of compression using 6 to 8 Mb/s on NTSC video produces an acceptable result for broadcast. Proponent HDTV systems are utilizing basic data rates in the range 15 to 20 Mb/s. Almost everyone in the industry believes that a digital system will be selected by the FCC for terrestrial broadcast. Even if the FCC doesn't standardize on a digital system, the satellite industry will adopt one.

Audio

TV associated audio will be sent via some digital compression technology. The most likely candidate is Musicam where monaural audio can be transmitted with true CD quality at 128 kb/s, and left and right audio can be transmitted in 192 kb/s. Musicam is very close to becoming an international standard by a joint ISO and MPEG committee.

NTSC

At least 4 channels of compressed NTSC video will be transmitted in each transponder. The method used will be determined by whatever technology that proves to be best at the time the Local DBS is launched, probably in 1996.

HDTV

Each transponder will be capable of handling 2 HDTV channels. Whatever proponent system is ultimately selected as the standard by the FCC will be used in the Local DBS.

BLACKOUT FEATURES

Consider the case shown in Figure 7. At least 3 TV markets are covered by a single 200 mile spot beam. This will be the case in many urban areas in the U.S. Market integrity will be maintained through software by way of a blackout feature. At least 32 blackout combinations can be accommodated in each channel. Blackout regions can be defined by Postal Zip Codes and/or geographic coordinates. If a satellite station obtains program exclusivity for the entire beam, the coverage area and potential viewers can extend over twice the area of the average B Contour of a full service station. In any case, the satellite signal is not subject to the blockage and multipath so common in terrestrial broadcast. The so-called white areas of fringe reception in some markets will obtain excellent reception. The need for troublesome translators used in many markets will be eliminated.

A farsighted broadcaster might establish a second or third channel for a variety of reasons. Use your imagination. If the program is non-duplicating, the entire 200 or 300 mile area could be served. Selective data services and personal messages can be sent via the conditional access system used.

GROUND RECEIVERS

Ground Receivers will be capable of receiving either local or national DBS since they both will use the same technologies of compression and modulation. The upscale models will probably have antennas that can readily be pointed at any orbital slot in its field of view, either mechanically or preferably electronically. Figure 8 shows a block diagram of a DBS receiver, with the desirable features. Current planning calls for HDTV and NTSC digital signals to satellite receiver. For HDTV, the decompressor will be in the TV set.

ACKNOWLEDGEMENTS

The author wishes to thank the NAB and the staff of the Science and Technology Department for the invitation and the opportunity to present this paper. Ed Taylor and Selman Kremer are hereby acknowledged for their entrepreneurial spirit to move forward on this concept. Space Systems/Loral is also thanked for its contributions to this unique satellite system.

[redacted]

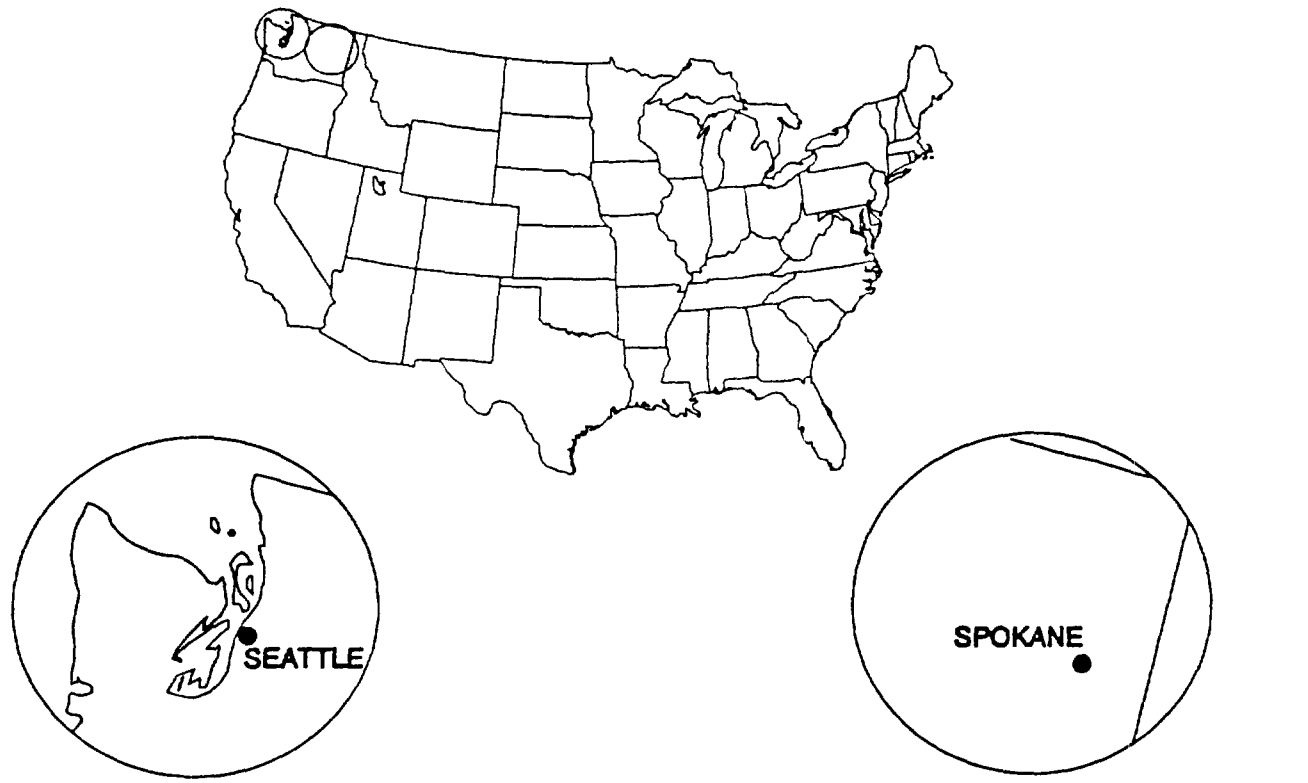


Figure 3 - Adjacent 200 Mile Beams

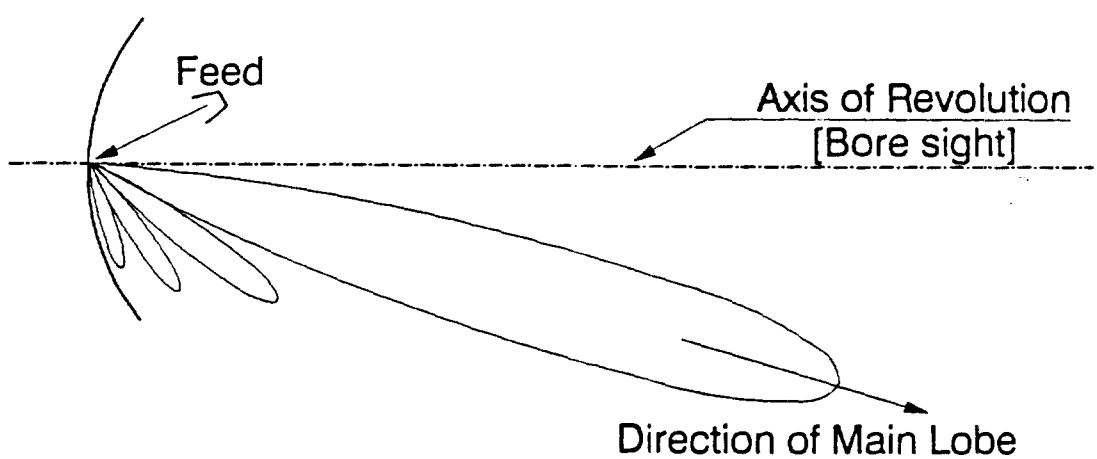
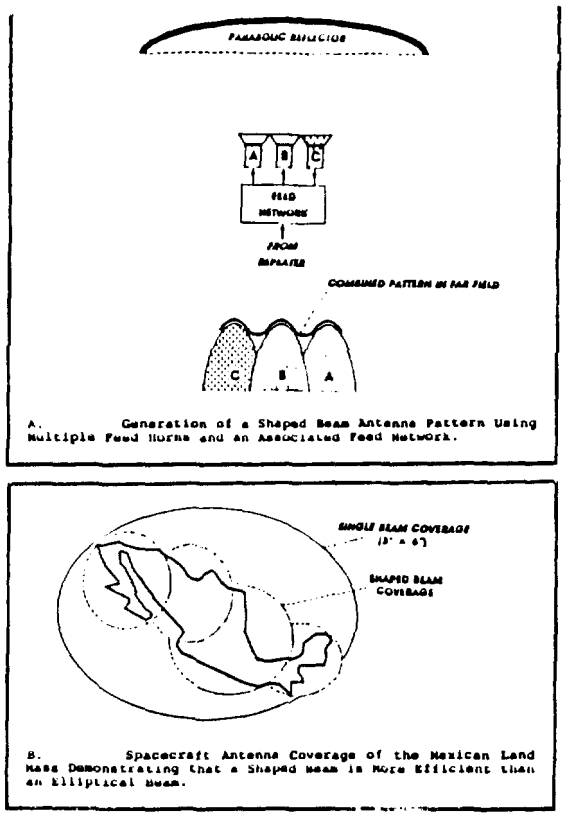


FIGURE 4 - ANTENNA PATTERN WITH FEED OFFSET FROM FOCUS

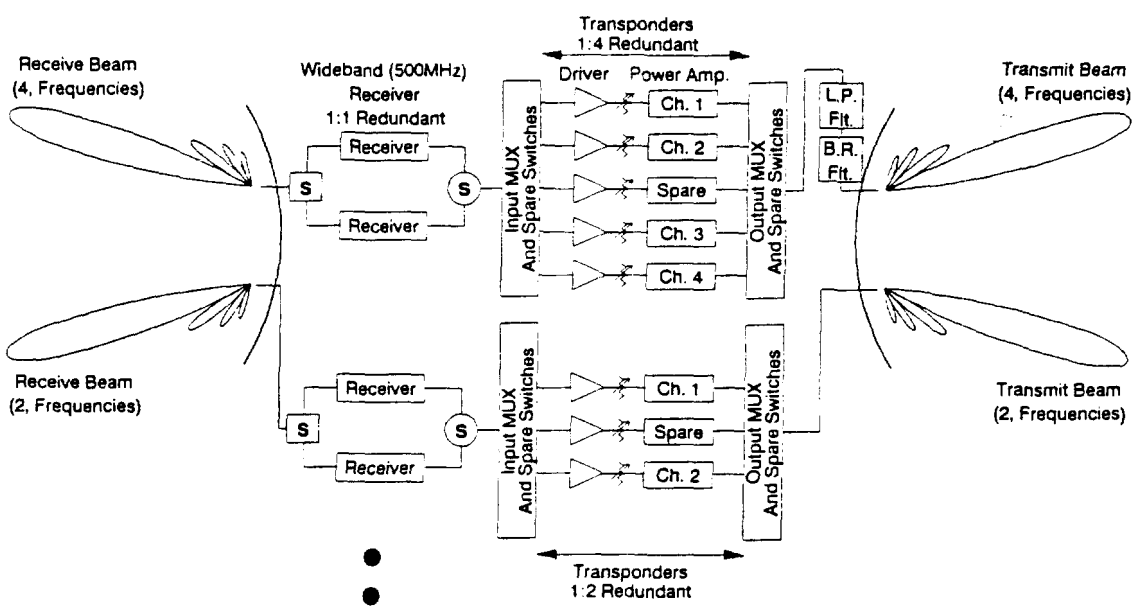


A. Generation of a Shaped Beam Antenna Pattern Using Multiple Feed Horns and an Associated Feed Network.

B. Spacecraft Antenna Coverage of the Mexican Land Mass Demonstrating that a Shaped Beam is More Efficient than an Elliptical Beam.

Figure 5 - Formation and Application of Shaped Beams

FIGURE 6 - SATELLITE PARTIAL BLOCK DIAGRAM



- Additional Sets
- One Set for Each Beam

Figure 7

- ELECTRONIC BLANKING with the BEAM
- Washington Local Stations cannot be received in Richmond or Baltimore.

June 1991

SPACE SYSTEMS/LORAL

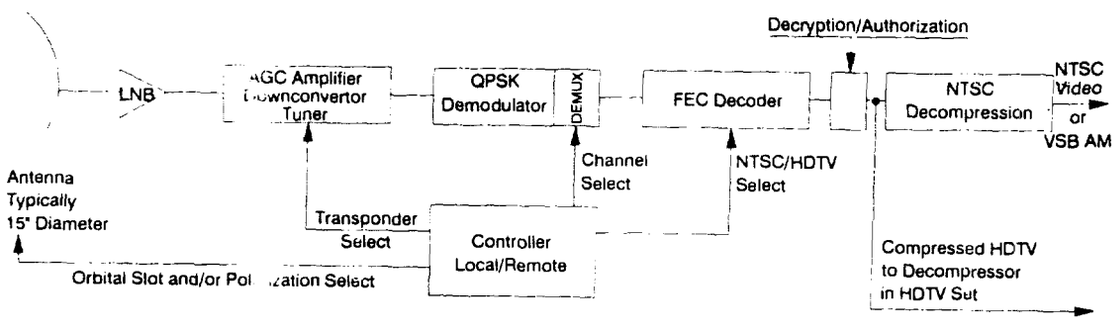


FIGURE 8 - DBS GROUND RECEIVER, BLOCK DIAGRAM

ATTACHMENT 4

LOCAL-DBS: PUTTING HDTV ON A FAST TRACK

FROM THE

1992 NAB HDTV CONVENTION PROCEEDINGS

APRIL 16, 1992

LOCAL-DBS: PUTTING HDTV ON A FAST TRACK

Edward L. Taylor
LOCAL-DBS, INC.
Tulsa, Oklahoma

#1 SLIDE LOCAL DBS

It's a privilege being the only member of this panel, at a Broadcaster's convention, talking about the Broadcasters' use of HDTV. My presentation this morning deals with the long sought-after concept of broadcasting television, on a local basis, from a satellite. What I have to say deals not only with that subject but also specifically addresses the Broadcasters' HDTV transitional problem. Broadcasters have convinced us that surviving the HDTV transition hurdle is their most serious concern.

#2 SLIDE NETWORK CHART

Broadcasters do realize we live in a world of constant change and that the "old order" of Broadcasting is gone. They also realize that new moneymaking opportunities abound for those Broadcasters savvy enough to adapt to the changes.

Without doubt, the greatest obstacle facing the Broadcasters centers around the fact that they are channel frozen and continue to lose audience share and advertising dollars to Cable TV programmers (as you can see from the slide). To make matters worse, terrestrial HDTV transmissions cannot fill in the blind spots and extend the range of local television without Broadcasters biggest competitor, Cable, filling in the missing pieces. Unless Cable provides additional channel space, the terrestrial broadcasting of HDTV will not be able to develop HDTV markets anywhere.

The Broadcaster who wishes to be free of the Cable shackle, who wishes to grow with news, sports and multiplexed services, and who would like to charge for his better HDTV product in order to improve profits, must look to new ways of doing things. This is not as difficult as it might seem, pro-

viding the Broadcaster is willing to make the changes his competitors will eventually force him to make anyhow.

We believe this is the time for Broadcasters to increase, not decrease, their control over program delivery. Also, Broadcasters need to show the Networks and Syndicators that TV stations can deliver crystal clear programs, throughout their entire ADI, without the use of Cable or Telco "middlemen".

#3 SLIDE LORAL SATELLITE

A new transmitting tower 22,000 miles up in the sky will allow Broadcasters to literally "rise above" the difficulties that presently exist.

WHAT IS LOCAL-DBS

#4 SLIDE UPLINKING/DOWNLINKING

By combining compression technology and satellite spot beam design, LOCAL-DBS is developing a facility that will allow each Broadcaster to self-deliver locally transmitted TV signals (HDTV or digital NTSC) direct to homes, schools or businesses using spot beams from high-power Direct Broadcast Satellites (DBS) into small dishes. This will allow each TV station in the contiguous USA to deliver one or multiple strong and clear HDTV and/or compressed NTSC signals directly to homes and, if it desires, to Cable systems in and beyond its present transmission reach. Boundaries for protecting program rights will be maintained through electronic addressing.

#5 SLIDE THREE SATELLITES

The project will eventually encompass three operating satellites and will include appropriate sparing. The first satellite will be launched in 1998, with the second and third following at relatively short intervals, as demand dictates. The satellites can each have 50 or more spot beams. Each beam extends approximately 200 miles, thus creating micro DBS systems each serving one or more television markets.

#6 SLIDE CHICAGO SLIDE

Generally speaking, we intend to share satellites and satellite orbital positions. This means eight to sixteen frequencies in an orbital slot might be devoted to spot beams and the remaining frequencies would be dedicated to full-Conus (contiguous U.S.) services by other providers.

#7 SLIDE MULTIPLE BEAMS OVER USA

What is interesting and intriguing is that prior to digital compression each frequency has occupied a full transponder and each transponder yielded only one TV channel.

#8 SLIDE FREQUENCY REUSE

However, in our spot beam plan each frequency is reused, within certain parameters, over and over again. Thus, each frequency can support ten or more spot beam transponders and each transponder, with compression, can support multiple channels (local TV stations). On a per transponder basis, compression allows us to double the number of channels for

cated the satellite receiver and antenna will cost the consumer around $700 initially. We believe this price will drop to around $300 rather quickly as penetration of DBS picks up.

The only additional item in the receiving equipment that we plan to introduce is a small motor to actuate the DBS receiving antenna so it can rapidly point to any DBS orbital position. This feature may add $50.00 to the cost of the receiving equipment, but it would enable a consumer to access all programming coming from the high-power DBS orbital arc.

The satellites will be operated as condominiums, with each Broadcaster owning its own channel(s) in a beam (or pattern) common to all stations in that locale. These local DBS channel transmissions will be equal to, in received strength, or stronger than the nationally distributed high-power DBS channels. On average, each transponder (one for each frequency use) in LOCAL-DBS spot beams will put out about 17.5 watts. Heavy rainfall areas such as the southeast states require higher wattage transponders to assist in rain attenuation situations.

An encryption system (scrambling for identification and control purposes) is required. Not only do we plan to use the same type reception equipment, as mentioned before, but we also plan to use the same compression standard and the same encryption system adopted by the full-Conus, high-power DBS operators (DirecTv and USSB) who expect to start their services in 1994. Broadcasters can profit from the encryption requirement, if they so desire, by utilizing it as a means to collect reception, subscription and/or programming fees.

Pricing for LOCAL-DBS satellite channels per se cannot be announced until our orbital slots and satellite construction contracts are finalized. However, as a rule of thumb, an HDTV channel should cost in the neighborhood of $2,000,000 to $7,500,000 over the life of the satellite and a digital NTSC channel from $700,000 to $3,000,000. Prices will vary from the highest figures for the largest markets to the lowest figures for the smallest markets.

#10 SLIDE REPEATS LOCAL-DBS #1

APRIL 16, 1992

THE BROADCASTERS' TIME FOR CHANGE IS RUNNING OUT

We believe the Television Broadcasting Industry has but a few years to regain control of its destiny in order to stop Cable from absorbing the functions of both the TV stations and maybe ultimately the Networks.

As we see it, HDTV programming, delivered directly to the home by the Broadcaster, before others can establish their HDTV delivery systems, is the only option Broadcasters have to regain their independence and preeminence.

AN HDTV LEAPFROG

Why not LEAPFROG over today's channel crunch, over the FCC's simulcast procedures, over the inherent inefficiencies of terrestrial transmissions and over the competition?

Sounds too pat or promotional, you might say. That's what Broadcasters said about the possible threat of Cable Programming just a decade ago. Broadcasters became accustomed to having plenty of time to plan before executing decisions. Well, excuse the play on words, compression is not only creating more channels but it is "compressing" the time available for the Broadcaster to make some extremely critical

We found that our concept of satellite transmission as supplementary to terrestrial distribution has been accepted by nearly all station principals to whom we have talked. However, due to the transitional economics crunch they face, most every TV station operator wanted us to postpone our satellite launches until at least 1998 and we are complying with this request.

Unfortunately, this long delay will give rise to a service problem for consumers who will begin to buy a million or more HDTV sets per year in 1995. These set owners will have HDTV programs available from VCR's, DirecTv/USSB satellite and from some Cable TV networks at that time, but not from Broadcasters. Most station owners admit that is not the competitive scenario they wish to face. Based on the foregoing dilemma of tough economics forcing a time delay that will have a negative competitive impact on the Broadcasters, we have designed a phased plan that will allow Broadcasters to remain competitive while providing a degree of economic relief that can literally be life-saving to local television stations.

This new plan places a Network's O&O or affiliate as the rightful distributor, in its territory, of a Network's HDTV DBS satellite feed. At all times the local station appears in control of the broadcast. This enables the station to maintain a base of HDTV customers for when it decides to build its HDTV station, at which time we believe the station should acquire a spot beam channel. Under this plan an O&O or affiliate can choose when to convert -- early 1995 or late in 1999 or maybe even never -- based on its economic situation and actual HDTV set sales in its market. What we're in the process of proposing to the Networks and key Syndicators works as follows:

#11 SLIDE

PUTTING HDTV ON A FAST TRACK
WITH LOCAL-DBS

THIS MANAGED HDTV CONVERSION PLAN

ENABLES TIMELY DELIVERY OF HDTV BY

NETWORKS---O&Os---AFFILIATES

(Would work the same for PBS and Independent stations.)

****

#12 SLIDE (GENERAL ASSUMPTION)

1995

CONSUMERS BEGIN TO BUY ONE MILLION

OR MORE HDTV SETS PER YEAR

&

NETWORK HDTV FEEDS BEGIN

****

#13 SLIDE NETWORKS CREATE HDTV DBS FEEDS

(Phases I & II)

1995 NETWORKS TRANSMIT HDTV DBS CHANNELS
(Repeat programming for west coast until hours of HDTV justify second feed.)

1996 N.Y.C. STATIONS TRANSMIT HDTV ON DBS CHANNELS AND TERRESTRIALLY

****

#14 SLIDE NETWORK FEEDS
(Phases III & IV)

1997 SEPARATE WEST COAST HDTV FEEDS BEGIN

1998 **LOCAL-DBS** LAUNCHES FIRST SATELLITE
(Network feeds continue for stations not on LOCAL-DBS spot beam channels.)

(All dates based on LOCAL-DBS estimates of HDTV set sales.)

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That's how the network feeds work. Now I'll talk more specifically

APRIL 16, 1992

#18 SLIDE

LOCAL CONTROL PHASES III & IV

[redacted]

APRIL 16, 1992

CONCLUSION

The conversion plan I have just outlined would eliminate the threat of Cable, DBS and VCR's stealing the Broadcasters' HDTV thunder. It would also benefit and give equal treatment to small and large market Broadcasters during the five to ten years it will take for the HDTV transition.

****

This is a copy of the presentation delivered at a panel on "HDTV ALTERNATIVE DELIVERY METHODS" during the 1992 NAB HDTV WORLD CONFERENCE held in Las Vegas, Nevada.

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